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| To: Commissioner for Patents for<br>**Examiner Thomas J. Mauro, Jr.**<br>**Group Art Unit 2143** | Facsimile No.: **703/872-9306** |
| From: Michele Morrow<br>Legal Assistant to Francis Lammes | No. of Pages Including Cover Sheet: 9 |

Message:

Enclosed herewith:

- Transmittal Document; and
- Reply Brief.

Re: Application No. **09/627,518**
Attorney Docket No: **RSW9-2000-0090-US1**

Date: Thursday, December 16, 2004

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**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

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| In re application of: **Cuomo et al.** | § | Group Art Unit: **2143** |
| Serial No.: **09/627,518** | § | Examiner: **Mauro, Jr., Thomas J.** |
| Filed: **July 28, 2000** | § | Attorney Docket No.:**RSW9-2000-0090-US1** |
| For: **Method and Apparatus for Affinity of Users to Application Servers** | § | |

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By: Michele Morrow
Michele Morrow

**TRANSMITTAL DOCUMENT**

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:
ENCLOSED HEREWITH:

- Reply Brief (37 C.F.R. 41.41).

No fees are believed to be required. If, however, any fees are required, I authorize the Commissioner to charge these fees which may be required to IBM Corporation Deposit Account No. 09-0461. No extension of time is believed to be necessary. If, however, an extension of time is required, the extension is requested, and I authorize the Commissioner to charge any fees for this extension to IBM Corporation Deposit Account No. 09-0461.

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Docket No. RSW9-2000-0090-US1 *PATENT*

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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| In re application of: **Cuomo et al.** | § | |
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| | § | Examiner: **Mauro, Jr., Thomas J.** |
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**Commissioner for Patents**
**P.O. Box 1450**
**Alexandria, VA 22313-1450**

<u>**Certificate of Transmission Under 37 C.F.R. § 1.8(a)**</u>
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By: Michele Morrow
Michele Morrow

## REPLY BRIEF (37 C.F.R. 41.41)

This brief is in response to the Examiner's Answer mailed October 21, 2004.

No fees are believed to be required to file a Reply Brief. Any required petition for extension of time for filing this brief and fees therefore, are dealt with in the accompanying TRANSMITTAL OF REPLY BRIEF.

## RESPONSE TO EXAMINER'S REMARKS

The Examiner's Answer, in response to Appellant's argument that the combination of Chung and Johnson fails to teach or suggest calculating a second value based on the first value in response to the first server being non-functional as recited in claims 1, 11 and 25, states:

> Examiner acknowledges the diagrams provided which intend to show the various flow diagrams for both the prior art and the instant invention, however, respectfully disagrees with the interpretation and diagram depicting the combination of Chung and Johnson. Johnson discloses calculating a second hash value from the first hash value that has already been hashed previously (See Johnson Col. 13 lines 30-32). Chung discloses that a first hash value is calculated from the client IP address and is then routed to the mapped server. See Chung Col. 4 lines 37-39 and 59-63 along with Col. 6 lines 62-67 and Col. 7 lines 64-67 – Col. 8 lines 1-3. Chung further teaches that after routing the packet, "when a server in the cluster fails, the subset of clients assigned to that server will not be able to connect to it." See Chung Col. 7 lines 5-6. Thus already the diagram of Chung-Johnson is incorrect as the "**Server 1 Not Operational**" should be indicated in exactly the same way as that shown in the presently claimed invention diagram. It is found in the Chung reference that if a first server is unavailable, i.e. non-functional, a second value is calculated. See Chung Col. 7 lines 9-12. The combination, as is interpreted by the Examiner, brings in Johnson to rehash the already hashed value in Chung only after the first server is deemed to be non-functional (See final rejection above), not immediately after the first hash value is calculated, as is asserted in the diagram of the combination of Chung and Johnsou submitted by the Applicant. Nowhere is it found in Johnson that the second hash value is calculated immediately after the first hash value is calculated, as is contended by the Applicant. Thus, Examiner disagrees with the Applicant's argument and reiterates that the Johnson reference, namely calculating a second hash value from a first hash value, is brought in only after the server has been determined to be non-functional, as was shown by Chung, thus teaching the exact same diagram as is claimed by the present invention.
>
> In conclusion, Applicant (See Page 9 of the Appeal Brief) agrees that Chung calculates a second hash function if a first server is unavailable; however, the second hash function is not calculated based on the first value from the first hash function. Johnson provides the deficiency in calculating a second hash value from an already hashed value, thus arriving at the applicant's invention.

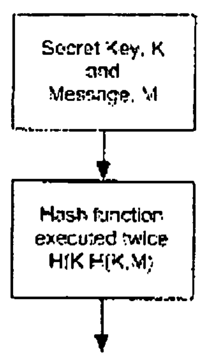
In addressing the teachings of Johnson, the Examiner's Answer alleges that Johnson discloses calculating a second hash value from the first hash value that has already been hashed previously (See Johnson Col. 13 lines 30-32) and nowhere is it found in Johnson that the second hash value is calculated immediately after the first hash value is calculated. Appellants respectfully submit that Johnson teaches calculating a second hash value from the first hash value that has already been

hashed previously (See Johnson Col. 13 lines 30-32) and that Johnson teaches calculating the second hash value immediately from the first hashed value at column 13, lines 15-32, which reads as follows:

> Different MAC types may be used depending on the amount of security that is desired. The method may be employed as follows:
>
> The two communicating parties already share a secret key K, a random value that may be, for example, 16 bytes.
>
> The key is prepended to the message M to be sent, which is represented as K,M.
>
> A hash function H is executed on the key and message data together H(K,M) to produce a digest D.
>
> The digest D is used as a MAC by appending it to the message and the result M,D is transmitted to the other party.
>
> There are certain types of cryptographic attack that can theoretically compromise this type of authentication code, so an improved MAC may be used. For example, the following MAC construction that performs a hash function twice is more secure than a single hash function such as the function H(K,H(K,M)).

In this section, Johnson clearly describes that message M is prepended with key K and hashed to produce H(K,M) and that value is hashed again with key K to produce H(K,H(K,M)). Thus, Johnson teaches hashing the same value twice and the first hashed value would be hashed immediately after the first hash value is hashed. This is shown in the following diagram:

Johnson Prior Art




In addressing the teachings of Chung, the Examiner's Answer alleges that Chung teaches that if a first server is unavailable, i.e. non-functional, a second value is calculated at column 7, lines 9-12, which reads as follows:

> The exemplary embodiments of the present invention to be described below

> utilize dispatching techniques in which servers are selected based on a hash value of the client IP address. The hash value may be generated by applying a hash function to the client IP address, or by applying another suitable function to generate a hash value from the client IP address. For example, given N servers and a packet from a client having a client address CA, a dispatching function in accordance with the invention may compute a hash value k as CA mod (N-1) and select server k to process the packet. This ensures that all request or reply packets of the same TCP/IP connection are directed to the same server in the server cluster. A suitable hash function may be determined by analyzing a distribution of client IP addresses in actual access logs associated with the servers such that client requests are approximately evenly distributed to all servers. When a server in the cluster fails, the subset of clients assigned to that server will not be able to connect to it. The present invention addresses this potential problem by dynamically modifying the dispatching function upon detection of a server failure. If the hash value of a given client IP address maps to the failed server, the client IP address is rehashed to map to a non-failed server, and the connections of the remaining clients are not affected by the failure.

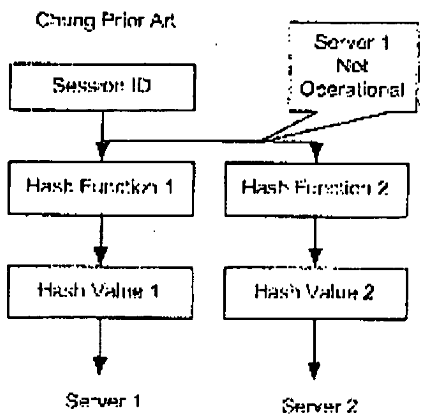
(Column 6, line 56 to column 7, line 12)

In this section Chung clearly describes that the client IP address is hashed to determine the server to direct the client packets to. In the event the hashed value of the given client IP address maps to a failed server, the client IP address is rehashed and not the prior given hashed client IP address. This is further supported by Chung at column 10, line 37 to column 11, line 4, which reads as follows:

> The routing-based and broadcast-based dispatching of the present invention can also provide load balancing and failure handling capabilities. For example, given N servers and a packet from client address CA, the above-described routing-based dispatching function may compute a hash value k as CA mod (N-1) and select server k to process the packet. More sophisticated dispatching functions can also be used, and may involve analyzing the actual service access log to provide more effective load balancing. In order to detect failures, each server may be monitored by a watchdog daemon such as the watchd daemon described in greater detail in Y. Huang and C. Kintala, "Software Implemented Fault Tolerance: Technologies and Experience," Proceedings of the 23.sup.rd International Symposium on Fault-Tolerant Computing--FTCS, Toulouse, France, pp. 2-9, June 1993, which is incorporated by reference herein. When a server fails, the corresponding watchd daemon initiates a change of the dispatching function to mask the failure and rebalance the load. A system call interface may be implemented to allow the dispatching function to be changed while the servers remain on-line. In routing-based dispatching, the watchd daemon may notify the dispatcher to change the dispatching function, while in broadcast-based dispatching, all servers may be notified to modify their filtering routines. For example, if a server k fails, the new

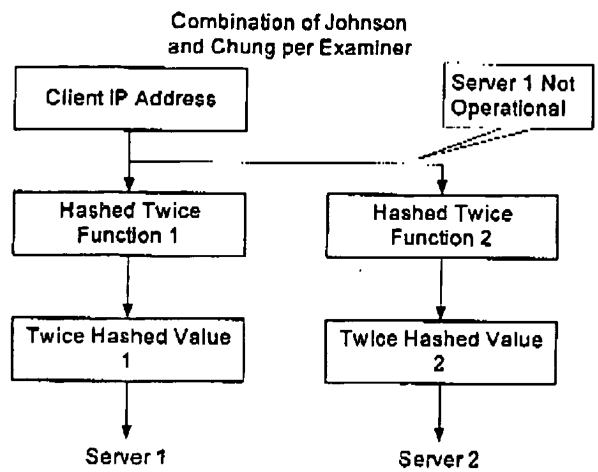
> dispatching function may check to see if the hash value CA mod N equals k. If it does, a new hash value j=CA mod (N-1) is computed. If j is less than k, the packet goes to server j. Otherwise, the packet goes to server j+1. This technique does not affect the clients of non-failed servers, reassigns the clients of the failed server evenly to the remaining servers, and can be readily extended to handle multiple server failures. Additional servers can be added to the cluster without bringing down the service by changing the dispatching function from CA mod N to CA mod (N+1). (emphasis added)

In this section Chung teaches that to determine a first server, hash value k is computed as CA mod N, where N is a given number of servers and CA is the client address. (Appellants respectfully submit that Chung has a discrepancy in this section as Chung teaches calculating a value for k in two manners. However, this discrepancy does not change Appellants argument). Then Chung teaches that if sever k fails a new server j is computed as a hash value j as CA mod (N-1). As can be clearly seen the value of j is not based in any part on the value of k which was the previously hashed server value. Thus, Chung does teach as shown in the following diagram:

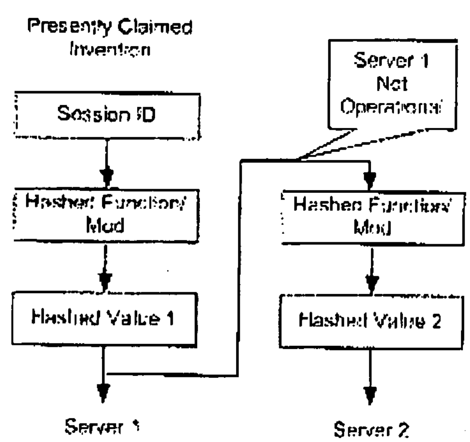



In addressing the combination of Chung and Johnson, the Examiner's Answer alleges that the combination, as is interpreted by the Examiner, brings in Johnson to rehash the already hashed value in Chung only after the first server is deemed to be non-functional. Although the diagram depicting the combination of Chung and Johnson was not entirely accurate, Appellants respectfully submit that it was not entirely incorrect. However, Appellants respectfully submit the following diagram to accurately depict the combination of the Chung and Johnson references. Johnson teaches only twice hashing the same message in the equation H(K,H(K,M)). Chung teaches a first hash value k = CA mod N and a second hash value calculated j = CA mod (N-1), both based on the

same client IP address. Then the combination of Chung and Johnson would be for Johnson to twice hash the first hash value k of Chung and, if the server fails, Johnson would twice hash the second hash value j of Chung. This is shown in the diagram as follows:




The result of the combination of Chung and Johnson still does not teach or suggest calculating a second value based on the first value in response to the first server being non-functional as recited in claims 1, 11 and 25, which is shown as depicted in the following diagram:




Independent claims 8, 18 and 26, recite similar subject matter to that of independent claims 1, 11 and 25. That is, independent claims 8, 18 and 26, recite "performing a hash function on the

first hash value to form a second hash value in response to the first server being non-functional." Thus, independent claims 8, 18 and 26, distinguish over the combination of Chung, Johnson, Muller and Khuc for at least the reasons noted above with regard to independent claims 1, 11 and 25.

In view of the above, Appellants respectfully submit that Chung, Khuc, Johnson and Muller, taken alone or in combination, fail to teach or suggest all of the features of claim 1, or the similar features found in independent claims 8, 11, 18, 25 and 26. At least by virtue of their dependency on claims 1, 8, 11 and 18, the specific features of dependent claims 2-5, 7, 9, 10, 12-15, 17, 19 and 20, are not taught or fairly suggested by Chung, Khuc, Johnson and Muller, whether taken alone or in combination. Accordingly, Appellants respectfully submit that the rejection of claims 1-5, 7-15, 17-20, 25 and 26 under 35 U.S.C. § 103(a) should be overturned.

## CONCLUSION

In view of the above, Appellants respectfully submit that claims 1-5, 7-15, 17-20, 25 and 26 are allowable over the cited prior art and that the application is in condition for allowance. Accordingly, Appellant respectfully requests the Board of Patent Appeals and Interferences to not sustain the rejections set forth in the Final Office Action.

Respectfully submitted,

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